



Denver Water

Standard Operating Procedure

Subject: Flushing and Testing of Dead-ends

Item: Blow Offs

Date: October 1, 1999

Revision Date:

Purpose

- A. A systematic once/year flushing program for dead-end mains with blow offs (BOs) is required to insure that specific water quality parameters are met. Parameters include turbidity, chlorine residuals, temperature, velocity, static pressure and flow.

Policy

- A. It shall be policy of Denver Water to conduct routine and systematic flushing of dead-end BOs in the distribution system once/year to maintain quality within the distribution system.
- B. It shall be policy of Denver Water to maintain a database documenting results.
- C. It shall be policy of Denver Water to maintain chlorine residuals not less than 0.20 in the distribution system.

Equipment

- A. A vehicle equipped with overhead warning lights and traffic safety equipment is essential in order to provide protection in traffic lanes for workers and to clearly delineate the presence of an unusual situation for drivers and pedestrians.
- B. Field maps (200' maps) of the existing water distribution piping, are required, to assist workers in determining the correct BO at a given location.
- C. Workers must have personal safety equipment (i.e: hard hat, safety vest, safety shoes, etc.).
- D. Tools required include a metal detector, aqua box locator, street valve keys, wey valve keys, three prong keys, fork keys, extensions for all keys, tunneling bar, hex cap removing key, pipe wrench, wire brush, thread chaser, lubricant (CML), pressure guage, various standpipes with petcock and pressure gauge attached, standpipe cap to obtain static pressure, standpipe adaptor for 1" BO, various couplings and extensions, wooden wedges, 4' by 4' flushing board, three way key, manhole puller, shovel, clappers, colorimeter, thermometer, turbidimeter, crescent wrench, tape measure (to measure outlet flowed) and leak listening device (sonophone).

Procedure

- A. Using maps and records from previous inspections, or new records, locate the correct BO in a given location. Previous records include remarks to help locate BO, specific problems or safety issues. It may be determined that a specific location should be flushed during another shift due to high pedestrian or vehicle traffic. Results concerning the BO that must be known and documented are:
 1. Location ID
 2. Map page (200' maps)
 3. Specific measurements of location
 4. BO outlet size
 5. Main size
 6. Type of valve (wey, wheel, gate, ball, etc.)
 7. Road condition (dirt, asphalt, etc.)
- B. Align vehicle in the street so as to cause minimal traffic interruption, as well as prepare for possible splashing from oncoming traffic while flushing BO.
- C. Utilize all personal safety equipment.
- D. Utilize all traffic safety equipment.
 1. Warning lights
 2. Traffic cones
 3. Flags with stand
 4. Flaggers if determined necessary
- E. Remove street valve lids for the operating valve and BO standpipe, or manhole lid.
- F. Thread standpipe with attached gauge. Use wooden wedges to secure standpipe in place before opening valve.
- G. Use specific valve key for BO valve.
- H. Document start time. Slowly turn on valve just enough to get a low flow to clear line before taking beginning samples.
- I. Document color and time to clear.
- J. Using colorimeter, thermometer, and turbidimeter, document beginning chlorine residual, temperature (celcius), and turbidity. It is important to note that high turbidity causes inaccurate chlorine residual readings.
- K. Open valve fully to continue flushing. If possible, reach minimum flow of 2.5 cu. ft./sec., using $Q = AV$, referring to chart based on coefficient of 0.90 to calculate gpm (many BOs are low flow).
- L. Document pitot and time flowed. Calculate gpm flow using flow chart based on coefficient of 0.90, flowing BO for a minimum of 10 minutes (there may be exceptions due to poor drainage and/or high beginning residual) to reach minimum requirements of 0.20 chlorine residual. If residual is low after 10 minutes, flow another 10 minutes, up to 30 minutes. If still low, this site may need further investigation and/or system improvements.

- M. Using the same equipment as in step "J.", document ending chlorine residual, temperature and turbidity.
- N. Turn off valve.
- O. Cap standpipe.
- P. Turn valve on again to obtain static pressure (pressure is obtained after flowing BO, so as not to clog gauge with sediment).
- Q. Turn off valve, remove equipment and replace valve lids
- R. Document any remarks pertinent to specific BO (i.e. repairs/maintenance needed, changes from previous flushing report).